# Fatigue Properties of Zinc Single Crystals and Polycrystals. II : Surface Markings Produced by Fatigue

# Fatigue Properties of Zinc Single Crystals and Polycrystals. II Surface Markings Produced by Fatigue*

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**Abstract**

Surface markings including slip lines, twin bands, cracks, and other markings, have been observed metallographically on zinc single crystals with [0001], [10$\bar{1}$0] and [11$\bar{2}$0] orientations and polycrystals as fatigued at room temperature by a cantilever rotating-bending testing machine. The [0001] single crystals fatigue-fracture along basal cleavage planes, on which the {10$\bar{1}$2} twin bands, striated patterns, river patterns, and {10$\bar{1}$0} cleavage steps are found. Only a few basal slip lines are observed on the lateral surface adjacent to the fracture position of the [0001] crystals, proving their small plastic and fatigue properties. The fatigued [10$\bar{1}$0] and [11$\bar{2}$0] crystals show (0001) [11$\bar{2}$0]and{11$\bar{2}\bar{2}$}<$\bar{1}\bar{1}$23>slip lines and {10$\bar{1}$2} twins, although the former type of slip is due to the heterogeneous stress distribution in the catilever rotating-bending fatigue test, and their fracture surfaces show stepped structures formed by alternative cleavages along the (10$\bar{1}$0) planes of the matrix and along the (0001) planes of twin crystals. The fatigued polycrystals show a transcrystalline fracture and, the characteristic surface markings observed on single crystals. No difference in markings in variously stressed specimens could be detected due to their fatigue-poor properties. It was found that no surface markings could be observed on single crystals stressed below the endurance limit, which is in accordance with the conclusion, reported by the author in a previous paper, that the endurance limit of single crystals is determined by the critical resolved shear stress of the active slip or twinning system.

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